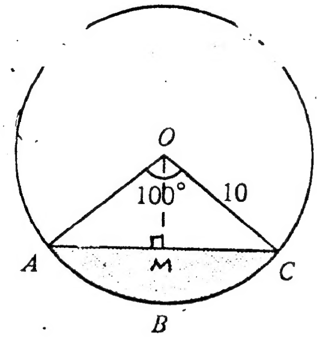
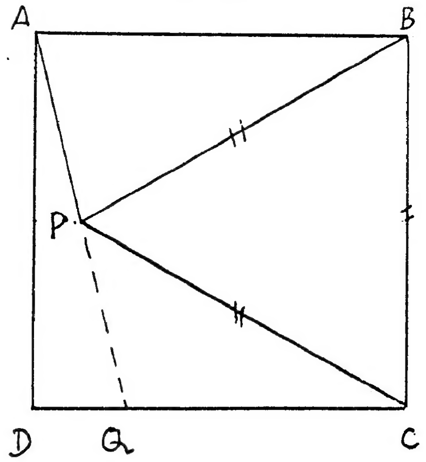
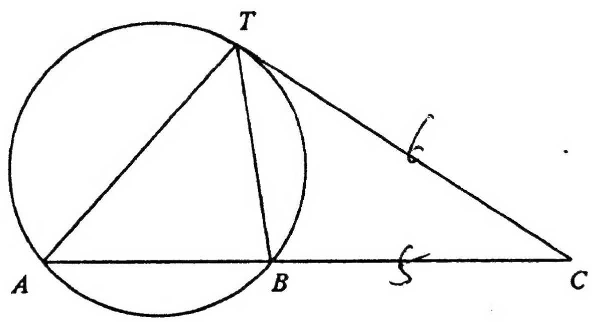
Solutions	Marks	Remarks
5. (a) Area of OABC $= \pi 10^2 \times \frac{100°}{360°}$	1M	
$= 87.27$ (corr. to 2 d.p.) (or 87.28)	1A	
(b) Area of $\triangle$ OAC $= \frac{1}{2} \times 10 \times 10 \times \sin 100°$	1M	$\triangle = \frac{1}{2} AC \times OM$
$= 49.24$ (corr. to 2 d.p.)	1A	$= \frac{1}{2} \times 15.3209 \times 6.4279$ ... 1M
		$= 49.24$ ... 1A
(c) Area of minor segment ABC		
$= 87.27 - 49.24$	1M	
$= 38.03$ (corr. to 2 d.p.) (or 38.04)	1A	
	6	
6. $\log 2 = r$, $\log 3 = s$.		
(a) $\log 18 = \log 2 \times 3^2$	1A	For $18 = 2 \times 3^2$
$= \log 2 + \log 3^2$)	1M	) $\log ab = \log a + \log b$ or
$= \log 2 + 2\log 3$)		) $\log a^2 = 2\log a$
$= r + 2s$	1A	
(b) $\log 15 = \log 3 \times 5$		
$= \log 3 + \log 5$		
$= \log 3 + \log \frac{10}{2}$	1A	For $5 = \frac{10}{2}$ or $15 = \frac{30}{2}$
$= \log 3 + \log 10 - \log 2$	1A	
$= 1 - r + s$	1A	
	6	
7. (a) The coordinates of the centre are given by		
$x = -(-\frac{4}{2})$, $y = -\frac{10}{2}$	1M	Centre = 2, -5
i.e. $x = 2$, $y = -5$	1A	(PP-1)
(b) As C touches the y-axis,		OR
its radius = 2	1M+1A	Subs. (0, -5) 1M
$4 + 25 - k = 2^2$	1M	$25 - 50 + k = 0$ $k = 25$ 1A
$k = 25$	1A	$r = \sqrt{4 + 25 - 25}$ 1M $= 2$ 1A
		OR
		Put $x = 0$, $y^2 + 10y + k = 0$ has equal roots. 1M $100 - 4k = 0$ $k = 25$ 1A r = etc.
	6	

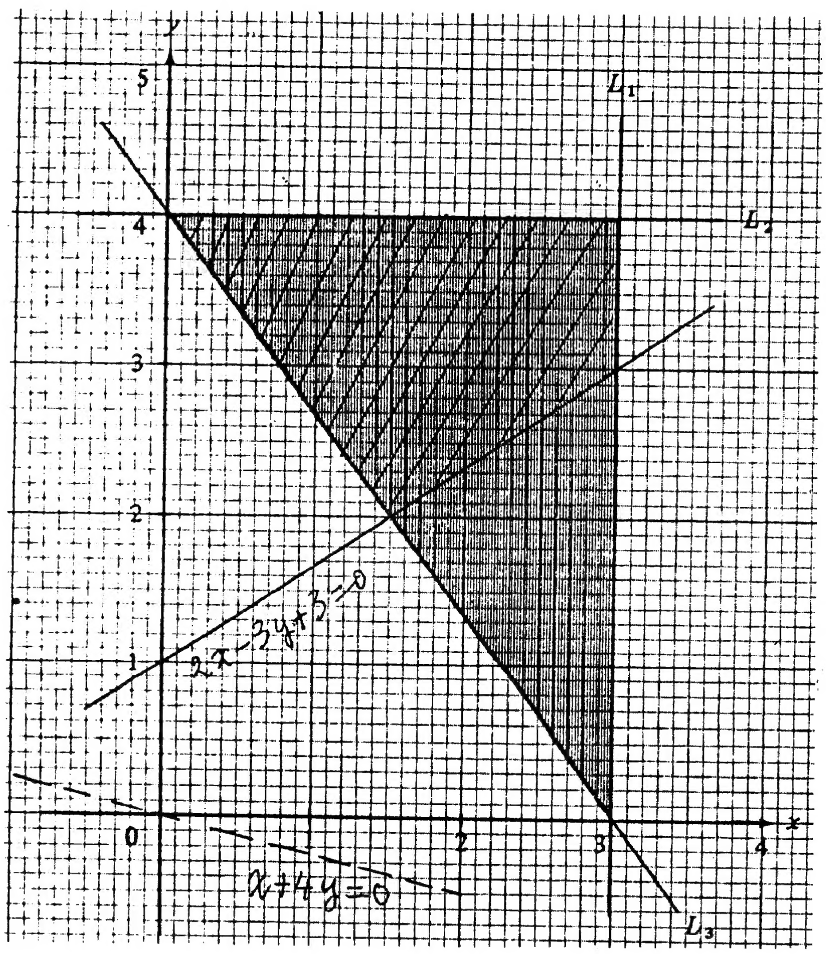
Solutions	Marks	Remarks
8. (a) (i) 		ABCD in order
	1	For P
	1	For Q (between D, C)
(ii) Since Δ PBC is equilateral, $\angle PBC = 60°$		Follow through even i[f] diagram not accurate
$\angle ABP = 90° - 60° = 30°$	1A	
As BA = BP , $\angle PAB = \frac{1}{2}(180° - 30°)$	1M	or equivalent
$= 75°$	1A	OR
Since AB // DC, $\angle PQC = 180° - 75°$	1M	$\angle PAD = 15°$
		$\angle PQC = 90° + 15°$ 1M
$= 105°$	1A	$= 105°$ 1A
(b) (i) $\triangle$ TCB is similar to $\triangle$ ACT because	1	∠BTC 寫成 ∠T (PP-1)
$\angle C$ is common.		
$\angle BTC = \angle BAT$ (angle in alternate segment)	1	Indication of 2 pairs of equal angles. With[-]held if proving con-gruence.
(ii) $\frac{AC}{CT} = \frac{CT}{BC}$	1A	Follow through even if (b)(i) wrong.
$AC = \frac{6^2}{5} = 7.2$	1A	
$\therefore AB = 7.2 - 5$		
$= 2.2 \quad (= \frac{11}{5})$	1A	
	5	



Solutions	Marks	Remarks
9. (a) Between 100 and 999,		
the smallest multiple of 7 is 105,	1A	
the largest is 994.	1A	
	2	
(b) The number of multiples is $\frac{994 - 105}{7} + 1$	2M	OR $994 = 105 + (n-1) \times 7$
$= 128$	1A	
The sum of these multiples		
$= 105 + 112 + \dots + 994$		
$= \frac{128}{2}[105 + 994]$	2M	$\frac{994}{7} - \frac{105}{7} + 1$
$= 70336$	1A	
	6	$= 142 - 15 + 1$
(c) The sum of all positive 3-digit integers	1	$= 128$
$= 100 + 101 + \dots + 999$		
$= \frac{900}{2}[100 + 999]$		
$= 494,550$	1A	
The required sum $= 494,550 - 70,336$	1M	
$= 424,214$	1A	
	4	

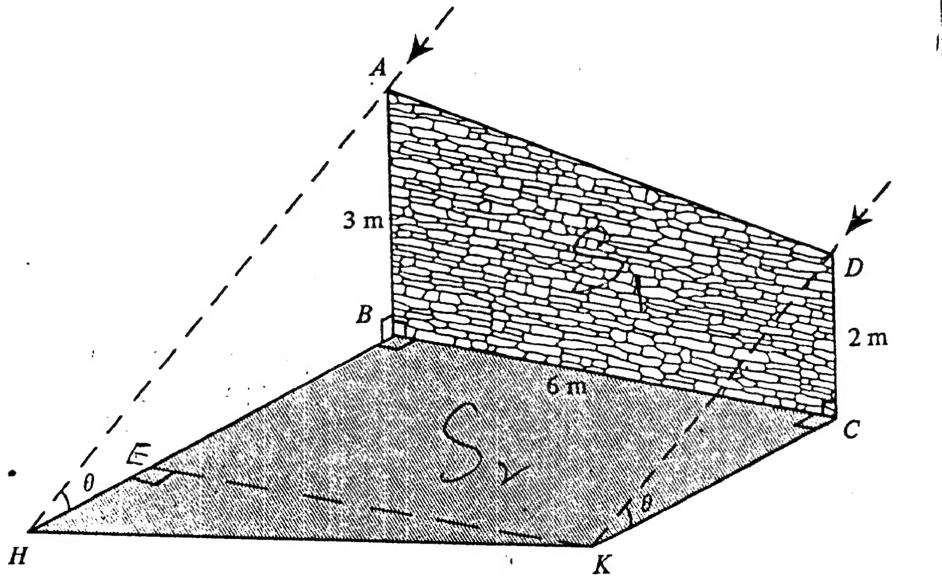
Solutions	Marks	Remarks
10. (a) Let $y = k_1x + k_2x^2$, where k_1 and k_2 are constants.	2	For $y=kx+kx^2$ or $y = kx+x^2$ or $y = x+kx^2$ 1
Putting $x = 1, y = -5$; $x = 2, y = -8$, we have	1M	$y = x+x^2$, $y = k_1 x$, $y = k_2 x^2$ } no mark.
$k_1 + k_2 = -5$	1A	
$2k_1 + 4k_2 = -8$	1A	
Solving, $k_1 = -6$, $k_2 = 1$	1A+1A	
$\therefore y = -6x + x^2$		
Putting $x = 6$, we have $y = 0$.	1A	
	8	
(b) $y = -6x + x^2 = (x^2 - 6x + 9) - 9$	1M	Equality must hold.
$= (x - 3)^2 - 9$	1A	
When $x = 3$, the value of y is least and the least value is -9.	1M+1A	
	4	
11. (a) From the curve,		
(i) the median is 70 marks.	1A	
(ii) the 1st quartile is 50 marks.) the 3rd quartile is 86 marks.)	1A	for either
$\therefore$ the interquartile range $= 86 - 50$	1M	$(86 \pm 3) - (50 \pm 3)$
$= 36$ marks	1A	
	4	
(b) (i) From the curve, the number of prize-winners = 60.	1A	
(ii) The probability that the student is a prize-winner $= \frac{60}{600}$ $(= \frac{1}{10})$.	1M+1A	
(iii) (1) The probability that both are prize-winners is $\frac{60}{600} \times \frac{59}{599} = \frac{59}{5990}$ $(=0.01)$	1M+1A	Accept $\frac{1}{10} \times \frac{1}{10} = \frac{1}{100}$. 1M for product rule
(2) The probability that both are not prize-winners $= \frac{540}{600} \times \frac{539}{599}$ $(= \frac{4851}{5990})$ $(=0.81)$	1A	Accept $\frac{9}{10} \times \frac{9}{10}$
$\therefore$ the probability that at least one is a prize-winner $= 1 - \frac{4851}{5990}$	1M	OR $\frac{9}{10} \times \frac{60}{599} + \frac{1}{10} \times \frac{540}{599} + \frac{1}{10} \times \frac{59}{599}$ 1M+1A
$\frac{60}{600} \cdot \frac{540}{599} + \frac{540}{600} \cdot \frac{60}{599} + \frac{60}{600} \cdot \frac{59}{599}$ $= \frac{1139}{5990}$ $(=0.19)$	1A	$= \frac{1139}{5990}$ 1A
	8	

Solutions	Marks	Remarks
12. (a) L_3 is given by $\frac{x}{3} + \frac{y}{4} = 1$ $\quad \frac{y-0}{x-3} = \frac{4-0}{0-3}$	1M	or 2-pt form, etc.
i.e. $4x + 3y = 12$	1A / 2	Must be in this form.
(b) The three constraints are $y \leqslant 4$	1A	Withhold 1 mark if '=' omitted.
$x \leqslant 3$	1A	
$4x + 3y \geqslant 12$	1A / 3	or $4x + 3y - 12 \geqslant 0$.
(c) The line $x + 4y = 6$ drawn in the diagram.	1M+1A	For 1A Drop of 2-3 verticle units for 10 horizontal units. OR Testing any vertices 1M
From the diagram, P is greatest when $x = 3$, $y = 4$ and least when $x = 3$, $y = 0$.		
The greatest value of $P = 19$,	1A	At (3, 0), P = 3. At (0, 4), P = 16.
the least value = 3.	1A / 4	At (3, 4), P = 19. 1A



Solutions	Marks	Remarks
(d) The line $2x - 3y + 3 = 0$ drawn in the diagram.	1A	±1 unit at (1.5, 2), (3, 3).
The shaded region.	1A	Should be reasonably shaded.
P is least when $x = \frac{3}{2}$, $y = 2$.		At (3, 3), P = 15. At (1.5, 2), P = 9.5.
The least value = $\frac{19}{2}$ (= 9.5)	1A / 3	

Solutions	Marks	Remarks
13. (a) $\frac{AB}{HB} = \tan\theta$.	1M	Wrong/no unit, pp-1.
$HB = \frac{3}{\tan\theta}$ m	1A	2 + 1
$\frac{DC}{KC} = \tan\theta$, $KC = \frac{2}{\tan\theta}$ m	1A	
	3	
(b) (i) $S_1 = \frac{6}{2}(3 + 2)$		
$= 15\ m^2$	1A	$\frac{15}{\frac{15}{\tan\theta}} = \tan\theta$
(ii) $S_2 = \frac{6}{2}\left(\frac{3}{\tan\theta} + \frac{2}{\tan\theta}\right)$		no mark
$= \frac{15}{\tan\theta}\ m^2$	1A	$\therefore \tan\theta = \tan\theta$
$\therefore \frac{S_1}{S_2} = \frac{15}{\frac{15}{\tan\theta}} = \tan\theta$	1A	Must show working.
	3	$\frac{S_1}{S_2} = \frac{15}{\frac{15}{\tan\theta}} = \tan\theta$ (pp-1) 缺寫



Solutions	Marks	Remarks
(c) Let $KE \perp BH$.	1M	Construction of perpendicular line
$EK = BC = 6$ m	1A	
$HE = \frac{3}{\tan\theta} - \frac{2}{\tan\theta} = \left(\frac{3}{\tan 30^\circ} - \frac{2}{\tan 30^\circ}\right)$ m $(= \sqrt{3})$	1M+1M	
$\therefore HK = \sqrt{HE^2 + EK^2}$	1M	
$= \sqrt{(\sqrt{3})^2 + 6^2}$		
$= \sqrt{39}$ m	1A	
	6	

Solutions	Marks	Remarks

14. (a) (i) $x^3 - \frac{4}{3}x - 6 = 0$ can be written as

$x^3 = \frac{4}{3}x + 6$. — 1M — optional

Consider the line $y = \frac{4}{3}x + 6$. — 1A+1A — 1A for equation; 1A for line drawn, ±1 vertical division about (0, 6), (3, 10)

It cuts the curve $y = x^3$ at $x = r$,

where r lies between 2.0 and 2.1 . — 1A

(ii) Let $f(x) = x^3 - \frac{4}{3}x - 6$

$f(2) = -(= -0.67)$

$f(2.1) = +(=0.46)$ .... — 1M — optional — Correct change of sign.

Interval	Mid-value x	f(x)
$2.000 < r < 2.100$	2.050	$-(=-0.12)$
$2.050 < r < 2.100$	2.075	$+(=0.17)$
$2.050 < r < 2.075$	2.063	$+(=0.02)$
$2.050 < r < 2.063$	2.057	$-(=-0.04)$
$2.057 < r < 2.063$		

1M+1A — 1M for choosing mid-value, 1A for correct sign.
1M — Next correct step.

$\therefore\ r = 2.06$ (correct to 2 d.p.) — 1A — 9

Alt. Solution:

$f(2) = -$
$f(2.5) = +$) .... — 1M — optional

Interval	Mid-value x	f(x)
$2.000 < r < 2.500$	2.225	+
$2.000 < r < 2.225$	2.113	+
.	.	.
.	.	.
.	.	.

1M+1A
1M

$\therefore\ r = 2.06$ (correct to 2 d.p.) — 1A

(b) Put $x = t + 1$ — 1A

The given equation can be written

as $3x^3 - 4x - 18 = 0$

or $x^3 - \frac{4}{3}x - 6 = 0$

By (a), the solution is

$t = 2.06 - 1$ .... — 1M

$= 1.06$ (correct to 2 d.p.) — 1A — 3

Solutions	Marks	Remarks

14.